PRELIMINARY STUDY ON THE EFFECT OF REDUCED GRAPHENE OXIDE, GOLD NANOPARTICLES, AND NAFION (R) CONCENTRATION ON REDOX PEAK CURRENT FOR ELECTROCHEMICAL BIOSENSING

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Abstract

Electrochemical characterization of graphene-based nanocomposites as transducer nanomaterial for highly sensitive biosensors was performed. Parameters that were varied include graphene oxide (GO) concentration, amount of added gold nanoparticles (AuNPs), and Nafion (R) as binder for enhancing electrical conductivity of the transducer layer. The nanocomposite-modified glassy carbon electrode (GCE) transducer layers were fabricated via a simple two-step drop-cast and subsequent electrochemical reduction. Cyclic voltammetry (CV) was used to characterize the redox capability of the transducer layer. Electrochemical deposition of ultra-highly concentrated single-layer graphene oxide (UHC GO) suspension with a concentration of 6 mg/ml gave highest anodic peak current I-pa,I-,I- similar to 0.6 mA, after electrochemical reduction, compared to most peak currents reported in the literature for an electrode with an inner diameter of 3 mm; adding UHC GO:AuNPs in a 2:1 ratio followed by electrochemical reduction resulted in even higher I-pa (0.4 mA higher) in comparison to reduced UHC GO alone, whereas adding UHC GO:Nafion (R) in an 8:1 ratio shows a 1-mA increase in peak current. Therefore, AuNPs and Nafion (R) can be added to reduce UHC GO as nanocomposite for the development of a redox-active transducer that can result in highly sensitive biosensors.

Keywords

Author Keywords: Cyclic voltammetry; Graphene nanocomposites; Gold nanoparticles; Nafion (R); Single-layer graphene
KeyWords Plus: PRINCIPLES; SENSORS

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